

## **REMARKS**

The following remarks are provided in response to the Office Action (“office action”) mailed April 30, 2008 in which the office action:

- objected to claims 1-10 because of informalities.
- rejected claims 1-3, 9-12, and 14 under 35 U.S.C. §103(a) as being unpatentable over US 6,013,399 to Nguyen (hereinafter Nguyen) in view of US 5,429,730 to Nakamura, et al. (hereinafter Nakamura).
- rejected claims 4 and 13 under U.S.C. §103(a) as being unpatentable over Nakamura and Nguyen in view of US 5,916,365 to Sherman (hereinafter Sherman).
- rejected claims 5 and 6 under U.S.C. §103(a) as being unpatentable over Nakamura and Nguyen in view of US 6,449,086 to Singh (hereinafter Singh), and further in view of US Pub. 2002/0028556 to Marsh, et al., (hereinafter Marsh), with reference to US 6,762,072 to Lutz (hereinafter Lutz).
- rejected claims 7 and 8 under U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura and Singh in view of US 4,950,498 to Kaito (hereinafter Kaito).
- rejected claim 15 under U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura in view of US 5,928,817 to Yan (hereinafter Yan).
- rejected claim 16 under U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura in view of US Pub. 2004/0007722 to Narui, et al., (hereinafter Narui).
- rejected claim 17 under U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura and Yan in view of US Pub. 2004/0007560 to Sakano, et al.

(hereinafter Sakano).

- rejected claim 18 under U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura, Yan and Sakano in view of US Pub. 2002/0051846 to Kirkpatrick, et al. (hereinafter Kirkpatrick).

The Applicants respectfully request reconsideration of the above referenced patent application for the following reasons:

**Objection of claims 1-10 because of informalities**

Claims 1-10 are objected to because claim 1 states “in a capping layer *to* a chamber.” The Examiner believes this should read “...*in* a chamber.”

The Applicants herein amend independent claim 1, from which claims 2-10 depend, and respectfully request reconsideration of claims 1-10 in view of the amendments.

**Claims 1-3, 9-12, and 14 rejection under 35 U.S.C. §103(a)**

Claims 1-3, 9-12, and 14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nguyen in view of Nakamura. The Applicants herein amend independent claim 1.

Amended independent claim 1, from which claims 2-3 and 9-10 depend, is directed at a “*method for repairing a defect in an EUV mask*” including the elements, “*placing, in a chamber, a multilayer work-piece having a pinhole in a capping layer thereon, “introducing a precursor gas into the chamber in the immediate area of the*

*multilayer work-piece,” and “directing an electron beam at the pinhole of the multilayer work-piece to fill the pinhole with a filling material generated from the precursor gas.”*

Independent claim 11, from which claims 12 and 14 depend, includes similar elements. That is, in claims 1-3, 9-12 and 14, the Applicants teach and claim filling, with a filling material, a pinhole in a capping layer of an EUV mask.

The proposed combination of Nguyen and Nakamura fails to disclose filling, with a filling material, a pinhole in a capping layer of an EUV mask. As the office action points out, Nguyen does disclose repairing defects that appear in a capping layer of an EUV mask. (See office action, p. 3, first paragraph.) However, the only defects that Nguyen discloses are either 1) particulate defects on capping layer 43 (see Nguyen, e.g., col. 4, lines 11-13) or 2) uncorrectable defects in an absorbing layer pattern 46 which is disposed above capping layer 43 (see Nguyen, e.g., col. 4, lines 1-3 and Fig. 2.) Thus, Nguyen fails to disclose pinhole defects in a capping layer of an EUV mask or repairing pinhole defects in the capping layer of the EUV mask, as taught and claimed by the Applicants. Instead, the office action relies on Nakamura to disclose “*a method of correcting recessed defects (claimed pinholes) in a film.*” (See office action, p. 3, first paragraph.) However, citing *In Re Ratti*, the M.P.E.P. states,

“[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.” (See M.P.E.P. 2143.01 § VI.)

The proposed combination of Nguyen with Nakamura improperly changes the principle of operation of Nguyen and thus fails to disclose filling, with a filling material, a pinhole

in a capping layer of an EUV mask.

Specifically, Nguyen discloses removing an entire absorbing layer (and, where appropriate, an entire buffer layer) and depositing a new absorbing layer “to provide a defect free pattern.” (*See* Nguyen, e.g., col. 4, line 4 – col. 5, line 7.) That is, the defects on or above the capping layer of Nguyen are removed by removing material (e.g. particulates and/or an absorbing layer) from the surface of the capping layer. On the other hand, Nakamura discloses filling a “divot defect” in a film by adding material to a region of the film to fill the divot defect. (*See* Nakamura, e.g., col. 10, lines 31-49.) If the defects of Nguyen were repaired by the method of Nakamura, then regions of material would be added to portions of the capping layer 43 of Nguyen, instead of material being removed from the surface of the capping layer as disclosed by Nguyen. Thus, the proposed combination of Nguyen and Nakamura is improper because it would change the principle of operation of Nguyen.

Furthermore, for the sake of argument, to the extent that other embodiments of Nakamura do not change the principle of operation of Nguyen, e.g. those embodiments directed at removing a bump defect (*see* Nakamura, e.g., Abstract), then the combination of Nguyen and Nakamura would fail to provide a prima facie rejection of claims 1-3, 9-12 and 14, which are directed at filling a pinhole defect.

Accordingly, the Applicants respectfully request the Examiner to remove the rejection of claims 1-3, 9-12 and 14.

**Claims 4 and 13 rejection under 35 U.S.C. §103(a)**

Claims 4 and 13 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura and Nguyen in view of Sherman. Claim 4 depends from independent claim 1 and claim 13 depends from independent claim 11. The Applicants respectfully request reconsideration of claims 4 and 13 in view of the above arguments regarding independent claims 1 and 11.

**Claims 5 and 6 rejection under 35 U.S.C. §103(a)**

Claims 5 and 6 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura and Nguyen in view of Singh, and further in view of Marsh, with reference to Lutz. Claims 5 and 6 depend from independent claim 1. The Applicants respectfully request reconsideration of claims 5 and 6 in view of the above arguments regarding independent claim 1.

**Claims 7 and 8 rejection under 35 U.S.C. §103(a)**

Claims 7 and 8 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura and Singh in view of Kaito. Claims 7 and 8 depend from independent claim 1. The Applicants respectfully request reconsideration of claims 7 and 8 in view of the above arguments regarding independent claim 1.

**Claim 15 rejection under 35 U.S.C. §103(a)**

Claim 15 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nguyen,

Nakamura in view of Yan. Claim 15 depends from independent claim 11. The Applicants respectfully request reconsideration of claim 15 in view of the above arguments regarding independent claim 11.

**Claim 16 rejection under 35 U.S.C. §103(a)**

Claim 16 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura in view of Narui. Claim 16 depends from independent claim 11. The Applicants respectfully request reconsideration of claim 16 in view of the above arguments regarding independent claim 11.

**Claim 17 rejection under 35 U.S.C. §103(a)**

Claim 17 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura and Yan in view of Sakano. Claim 17 depends from independent claim 11. The Applicants respectfully request reconsideration of claim 17 in view of the above arguments regarding independent claim 11.

**Claim 18 rejection under 35 U.S.C. §103(a)**

Claim 18 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nguyen, Nakamura, Yan and Sakano in view of Kirkpatrick. Claim 18 depends from independent claim 11. The Applicants respectfully request reconsideration of claim 18 in view of the above arguments regarding independent claim 11.

## CONCLUSION

The Applicants submit that they have overcome the office action's objections to and rejections of the claims and that they have the right to claim the invention as set forth in the listed claims. The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

Pursuant to 37 C.F.R. 1.136(a)(3), the Applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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